

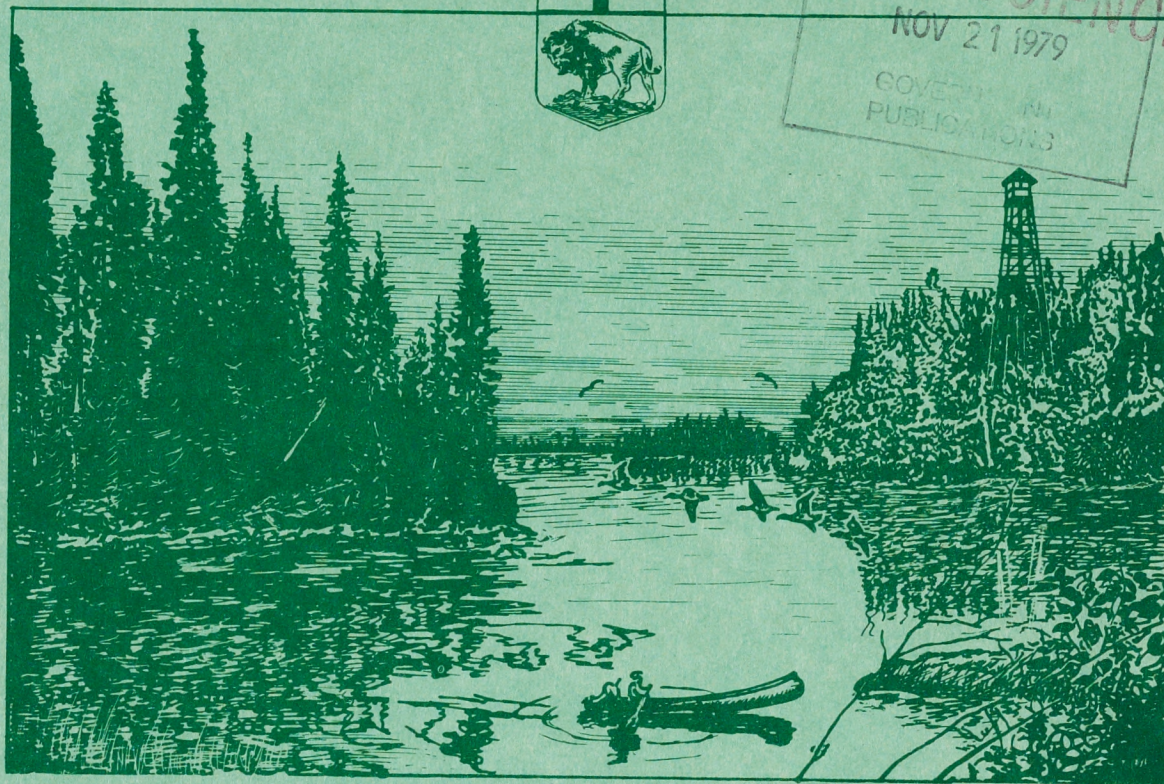
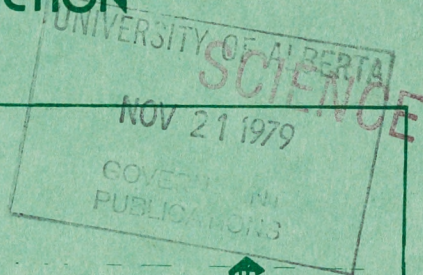
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Report No. 4

MOUNTAIN FOREST SECTION



Forest Resources Inventory

—1956—



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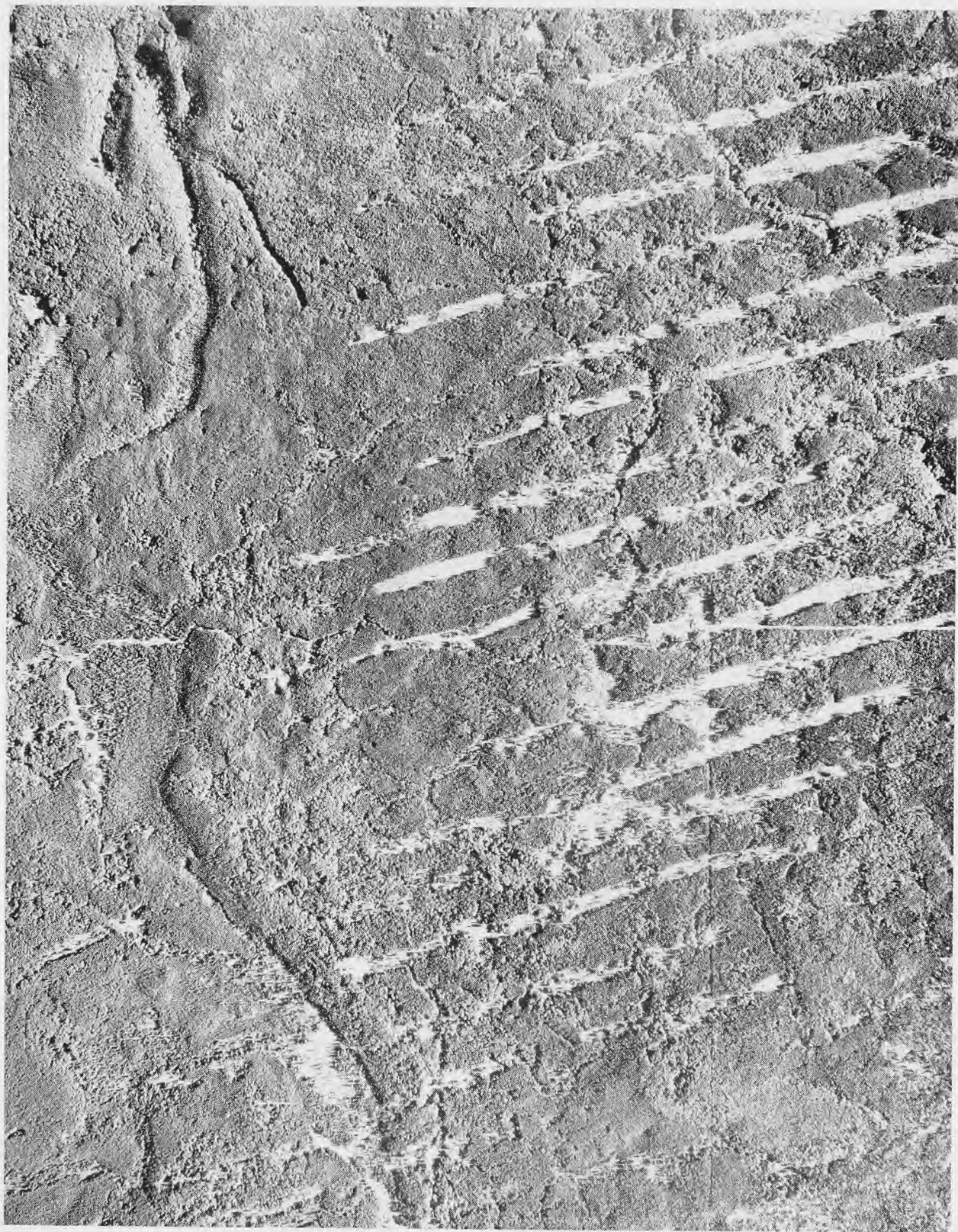


Forest Resources Inventory 1956

Report No. 4
MOUNTAIN FOREST SECTION



FOREST SERVICE
Department of Mines and Natural Resources
PROVINCE OF MANITOBA
Winnipeg, 1958



Forest Resources Inventory Photograph Showing strip cutting on the slopes of the Duck Mountain—Scale 4 Inches to the Mile.

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Preface

This is one of a series of bulletins summarizing the results of the ground and aerial survey work which was completed in 1956 in connection with the latest Forest Inventory of Manitoba. The figures in this new series will replace those previously used based on surveys made between 1927 and 1930, and tabulated in "The Forests of Manitoba, Bulletin 85," published by the Dominion Forest Service in 1934.

For the purpose of the new Forest Inventory the Province has been divided (as shown on Map 1) into four zones based on climate, original vegetation and predicted future use, as follows:

Agricultural Forest	Transition from Forest to Tundra Tundra or Barren Lands
------------------------	--

The Forest Zone may be defined as the area which is producing or is capable of producing forest crops and which for climatic reasons is, in the main, more suitable for the production of wood than for agricultural crops. The Forest Zone has an over-all area (omitting the three major lakes—Winnipeg, Manitoba and Winnipegosis) of about 113,238 square miles or nearly half the total area of Manitoba (less these lakes).

Based on the presence or absence of transportation routes such as railways, highways and water routes, the Forest Zone is again divided into an Accessible and Inaccessible Area.

The Accessible Forest Zone with an over-all area of about 64,122 square miles has been divided for Inventory purposes into seven main Forest Sections based on physical geography and administrative boundaries, as follows:

Southeastern Winnipeg River Lowlands South Mountain	Lowlands North Nelson River Northern Mining
--	---

Each of the Forest Sections is again divided into Working Circles which conform with Forest Ranger Districts, except in the more northerly areas where on account of their large size it has been necessary to subdivide the Ranger Districts. In addition to the seven major Forest Sections listed above, the Accessible Forest includes two minor areas in southern Manitoba—the Spruce Woods and the Turtle Mountain Forest Reserves.

The Inaccessible Forest with an over-all area of about 49,116 square miles has been divided into 20 Inventory Units.

Although a limited amount of the Forest Zone was inventoried before 1951, the main work was done commencing April 1st, 1951, from which date the Federal Government has reimbursed to the Province one-half of the expenditures incurred in forest resources inventory under the terms of an agreement with the Province pursuant to the provisions of the Canada Forestry Act.

A separate report will be published for each of the seven major Forest Sections of the Accessible Area, and an eighth report will cover the Spruce Woods and Turtle Mountain. The whole of the Inaccessible Forest will be covered by an additional report.

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PREPARED BY FOREST MANAGEMENT DIVISION

C. B. Gill, Chief of Division

Ground control and base mapping by Surveys and Mapping Branch, Department of Mines and Technical Surveys, Ottawa; and by Forest Service, and Surveys Branch, Manitoba Department of Mines and Natural Resources.

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Maps Nos. 1 and 2 by P. Peloquin.

Tables Nos. 1 to 7 and Figures Nos. 1 to 10 by L. Pasterz.

Cover design by D. R. McTavish.



View downstream from control dam at Steeprock Lake, Porcupine.

Forest Resources

MOUNTAIN FOREST SECTION

Location and Area

The Mountain Forest Section includes three separate upland areas consisting of the Duck Mountain Forest Reserve, the Porcupine Forest Reserve, and the Riding Mountain National Park; these three areas together make up the forested portion of the area west of the Manitoba Escarpment. In the case of the Porcupine Forest Reserve, an area of about 25 square miles lying between the Canadian National Railway and the Forest Reserve boundary

in Township 44, Ranges 28 and 29 W.P.M. has been included with the Forest Reserve, while in the case of the Duck Mountain and Riding Mountain, the Forest Reserve and National Park boundaries have been followed. The total area covered by this report and estimate is 2,227,993 acres. This area includes all the Crown and patented land within the boundaries hatched on Map No. 2. The patented area is very small, being confined entirely to the Porcupine Subsection, and there are no Indian Reserves within the Forest Section.

Table 1

Area Classification by Subsections—Mountain Forest Section

Class of area	Riding Mountain National Park		Duck Mountain Forest Reserve		Porcupine Forest Reserve		Total Provincial Forest Reserves		Total	
	acres	% of land area	acres	% of land area	acres	% of land area	acres	% of land area	acres	% of land area
Productive forest land*	578,770	78.5	712,506	80.0	379,659	75.5	1,092,165	78.4	1,670,935	78.4
Potentially productive forest land†	100,288	13.6	45,655	5.1	39,417	7.8	85,072	6.1	185,360	8.7
Nonproductive forest‡	14,771	2.0	74,670	8.4	79,992	15.9	154,662	11.1	169,433	8.0
Permanently nonforested land‡	43,807	5.9	57,420	6.5	3,943	.8	61,363	4.4	105,170	4.9
TOTAL LAND.....	737,636	100.0	890,251	100.0	503,011	100.0	1,393,262	100.0	2,130,898	100.0
WATER.....	27,622	3.7	38,411	4.3	31,062	6.2	69,473	5.0	97,095	4.6
TOTAL AREA.....	765,258		928,662		534,073		1,462,735		2,227,993	

*Land supporting merchantable timber or young growth which will produce merchantable timber within a reasonable time.

†Cut-over, burn, brush or grassland, not now supporting productive forest, but capable of doing so.

‡Land with a forest cover such as treed muskeg, treed rock, and willow or alder swamp, but incapable of producing a forest crop of merchantable size within a reasonable time.

‡Includes marsh, muskeg, rock, meadow, developed agricultural land, urban areas, roads and railroads. In general, lands not expected to produce forest of any kind.

Geology

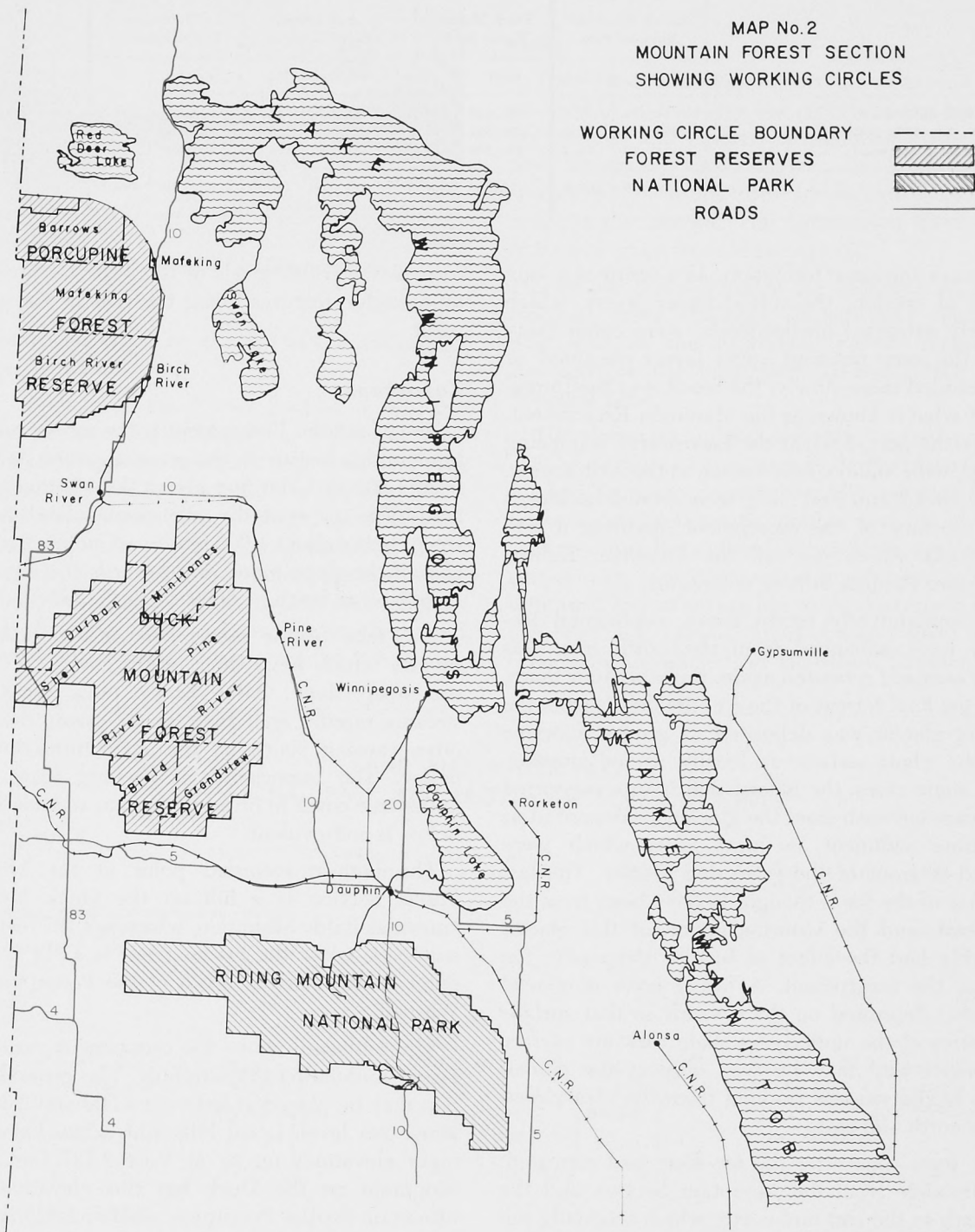
In Cretaceous time, about 50 to 100 million years ago, the southwestern part of what is now Manitoba was covered by a salt water sea. To the north and east lay a continent consisting of a Precambrian core with a margin of Palaeozoic limestone. The southwestern shore of the continent was approximately on a line along the west side of the lakes now known as Manitoba, Dauphin, Swan, and Red

Deer. In the Cretaceous sea was deposited the debris, mostly fine-textured material, eroded from the continent. By compaction, the clay debris was transformed into rock, largely shale. In later time, the sea retreated or the land rose so that the Cretaceous strata became land.

The upper layers of the Cretaceous rock which geologists have given the name Riding Mountain formation were considerably harder than the lower

MAP No. 2
MOUNTAIN FOREST SECTION
SHOWING WORKING CIRCLES

WORKING CIRCLE BOUNDARY
FOREST RESERVES
NATIONAL PARK
ROADS



Map No. 2.

Table 2

Classification of Productive Forest Land by Cover Types—Mountain Forest Section

Cover type	Riding Mountain National Park		Duck Mountain Forest Reserve		Porcupine Forest Reserve		Total Provincial Forest Reserves		Total	
	acres	%	acres	%	acres	%	acres	%	acres	%
S: Over 75% Softwood.....	44,314	7.7	161,059	22.6	188,862	49.7	349,921	32.0	394,235	23.6
M and N: 75 - 25% Softwood.....	103,343	17.8	268,941	37.7	99,695	26.3	368,636	33.8	471,979	28.3
H: Under 25% Softwood.....	431,113	74.5	282,506	39.7	91,102	24.0	373,608	34.2	804,721	48.1
TOTAL.....	578,770	100.0	712,506	100.0	379,659	100.0	1,092,165	100.0	1,670,935	100.0

sections of the same formation. As a result of a long period of erosion, the softer, lower layers, which formerly extended northeasterly, were eaten away while the more resistant upper layers remained, or were eroded more slowly; the result was the formation of what is known as the Manitoba Escarpment. During the period when the escarpment was being shaped, wide valleys, now known as the Assiniboine, Valley, Swan, and Red Deer, were eroded backward from the face of the escarpment, dividing it into the blocks which we call the Pembina, Riding, Duck, and Pasquia hills or mountains.

In comparatively recent times, continental ice-sheets have advanced from the north over this whole area and retreated again, probably four times. With the final retreat of the ice, the debris from the melting glacier was deposited as ground moraine over the whole surface, or, locally, as end moraine, or, in some cases, the glacial debris was reassorted as stream outwash from the glacier, or deposited as lacustrine sediment in local lakes which were formed in front of the retreating glacier. The last advance of the ice is thought to have been from the northeast, and the scouring action of this glacier probably had the effect of further steepening the face of the escarpment. A heavy layer of glacial drift was deposited on the uplands so that surface exposures of the underlying shale rock are of rare occurrence and may be seen only in the eroded banks of the streams running from the escarpment to the north and east.

For some time after the ice-sheet had retreated, the drainage from the Mountain Section and the lowlands to the east and north, which originally ran towards Hudson Bay was still blocked by the ice-sheet so that the huge glacial Lake Agassiz was formed between the ice-sheet and the Manitoba Escarpment. Some of the beaches which were

formed at various levels of this lake are prominent topographic features along the foot of the escarpment.

Topography

The Manitoba Escarpment is the most prominent topographic feature in the province rising as it does from 1,200 to 1,700 feet above the Manitoba Lowlands. The rise from the adjoining lowlands is fairly steep, being about 1,000 feet in six miles, the steepness of the slope increasing towards the top where it may be as much as 500 feet to the mile.

The face of the escarpment is deeply cut by ravines which have their origin along the top of the steep slope. After heavy rains these short streams rapidly spill their water down the slope, often causing floods on the agricultural lowlands below. The importance of keeping these slopes under tree cover in order to prevent serious damage below is self-evident.

The highest recorded point in the Mountain Forest Section is a hill on the Duck Mountain known as Baldy Mountain, which is 2,727 feet above sea level, while the lowest point is 1,014 feet at a point on the railway north of the Porcupine, near Westgate.

The tableland above the escarpment varies from gently undulating to quite hilly. The general elevation may be placed at between 2,000 and 2,300 feet above sea level. Local hills and ridges have maximum elevations up to at least 2,727 feet. Baldy Mountain on the Duck has this elevation; Hart Mountain on the Porcupine reaches 2,625; while a point on the Riding, east of Clear Lake, is 2,410 feet above sea level. These high points are all near the edge of the escarpment and, in general, the tableland slopes very gently to the southwest, this



Shell River Ranger District Headquarters.

slope being governed by the dip of the underlying Cretaceous rock.

The drainage of the Forest Section is into the Assiniboine River, Lake Manitoba, and Lake Winnipegosis. The gentler southerly and westerly slopes are drained mainly by the tributary streams—Shell, Birdtail, Minnedosa, Valley, Swan, and Woody. Streams running to the north and east but whose headwaters penetrate the escarpment are the Ochre, Vermilion, Steeprock, and Armit. The main streams rising at the escarpment and trending northerly and easterly down the steeper slopes are the Whitemud,

Turtle, Wilson, Pine, Birch, and Bell, although there are a number of lesser streams running in the same direction.

Soils

The Mountain Forest Section has not been covered by soil surveys but reports of the Manitoba Soil Survey and reports on adjoining areas by the Soil Survey of Saskatchewan have covered the fringes of the various forest blocks as well as certain roads in the interior. The information given below is largely taken from these reports.

Soils are formed under the influence of parent material, relief, drainage, climate and vegetation. The soils of the Mountain Forest Section are grouped for the most part as within the Grey-Wooded Zone.

The dominant upland soils are leached podzolic soils of medium to light texture derived from glacial till and morainic deposits, usually associated with white spruce, balsam fir, poplar, and birch. Sandy soils resulting from glacial outwash are usually associated with jack pine, while poorly drained areas with peat formation are apt to support black spruce and tamarack. Limited areas of sandy loam to silty clay loam, developed on lacustrine sediments, are

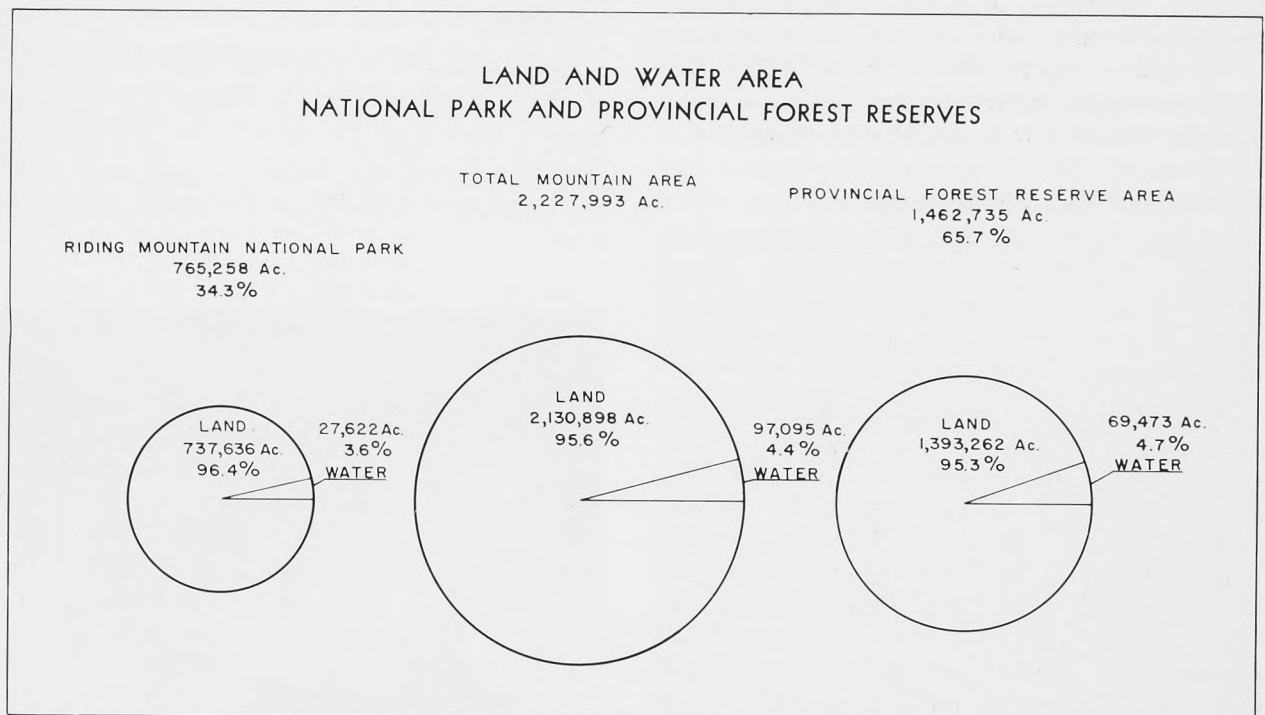


Figure 1.

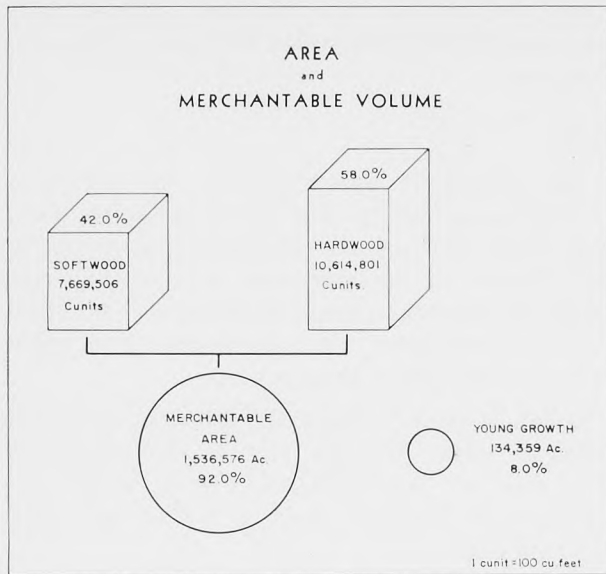


Figure 2.

the result of local glacial lakes which were formed when the ice-sheet was melting.

The well drained soils of the Grey-Wooded Zone were developed under cool, moist climatic conditions and a forest vegetation. These factors tend to produce a soil profile which is relatively low in decomposed organic matter. The downward percolation of water which is more or less acidic tends to remove certain materials from the upper layers of soil and to deposit them at lower depths. As a result, the upper layers have suffered considerable leaching and are low in available plant material.

Climate and Natural Vegetation

Elevation is a main factor in determining the climate and hence the vegetation of this area. In effect this results in an extension of the boreal forest, southerly and westerly into what would otherwise be aspen parkland or grassland.

No continuous meteorological record exists for any station in the Forest Section although precipitation and temperature records have been kept at the Riding Mountain Research Station during the summer months for 7 years, and at the original Durban Ranger Station on the Duck Mountain throughout the year for two years. Each of these stations is on "the mountain" and each station indicates cooler summers and greater precipitation as compared with weather stations for the same periods at points below. The annual precipitation on the forested

upland may be, judging by the scanty records available, as much as 50 per cent higher, making a total of approximately 25 inches. July mean daily maximum temperatures appear to be 3 to 4 degrees cooler, while January mean daily minima are probably colder by about the same amount. The length of the growing season may be judged by the dates of leafing out of the trees and the shedding of deciduous foliage, which events take place from 10 to 14 days later in the spring and about the same period earlier in the autumn.

The Mountain Forest Section corresponds approximately with the Manitoba portion of the Mixedwood Section, B18, of the Boreal Forest Region, as mapped in "A Forest Classification for Canada." The well drained soils usually have a forest cover of white spruce and aspen, with minor amounts of balsam fir, and white birch. The type may vary from pure white spruce, although this is unusual, to pure poplar or birch, and balsam poplar may also occur in slightly moister areas. Jack pine, sometimes mixed with aspen, often occupies the excessively drained areas while black spruce tends to take over the poorly drained areas, with or without a mixture of tamarack. Progressing from south to north and from lower to higher elevations, black spruce takes over from white spruce to a greater or less extent.

Bur oak reaches its northwest limit on the slopes of the escarpment near Mafeking, but is found sparsely throughout the upland area of the Riding Mountain. Green ash, Manitoba maple, and white elm occur on alluvial soils at the foot of the escarpment.



Forest Ranger's noon tea break in winter.

Table 3

*Area Classification of Productive Forest by Cover Types and Merchantability—
Mountain Forest Section*

Subsections	COVER TYPES IN ACRES							
	S		M and N		H		Total	
	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.
Riding Mountain National Park.....	11,846	32,468	16,619	86,724	97,776	333,337	126,241	452,529
Duck Mountain Forest Reserve.....	4,934	156,125	2,000	266,941	170	282,336	7,104	705,402
Porcupine Forest Reserve.....	1,014	187,848	99,695	91,102	1,014	378,645
TOTAL PROVINCIAL FOREST RESERVES.....	5,948	343,973	2,000	366,636	170	373,438	8,118	1,084,047
TOTAL.....	17,794	376,441	18,619	453,360	97,946	706,775	134,359	1,536,576

History

Little is known of the early history of the uplands and this may well be because they were relatively uninhabited, and because the travelled routes were by way of the main river valleys which divide the uplands and by way of the so-called "pitching ridges" which skirt the foot of the escarpment. The first record appears to be Henry Kelsey's journal of his trip from York Factory into the interior where he saw the buffalo (1690-1692). Some writers think that he ascended the Red Deer River into the hills; others favor the Swan River. His object appears to have been to encourage direct trade with the tribe which he quaintly calls the Mountain Poets, otherwise the Stony Sioux, or Assiniboines. Previous to this, the Cree tribes who inhabited the country closer to Hudson Bay had acted as middle-men in the trade between the Hudson's Bay Company and the interior tribes.

Hudson's Bay Company journals for the period of 1715-1731 speak of trade with the Susanews of Swan River. In 1756 Jos. Smith and Jos. Waggoner travelling with Swan River Indians crossed from Cedar Lake to the Porcupine Hills where they met French traders, wintering with the Indians. Canoes built on the Swan River were used by the Indians to transport their furs to York Factory. Fort Dauphin was built by Pierre la Verendrye in 1741 and from this time on the Hudson's Bay Company had to share the fur trade with, first, the French, and later, the English traders from Montreal.

Wm. Tomison of the Hudson's Bay Company was on the Riding Mountain in 1770. The Northwest Company built posts on the Red Deer, Swan, Val-

ley, and Assiniboine rivers in the years 1787 on, and the Hudson's Bay Company followed with opposition posts in the same vicinity, these posts being merged after the union of the two companies in 1821. The fur trade continued to be the only industry of the region until the prospect of railway development across the prairies, and along the foot of the escarpment, opened up the country for agricultural development. The settlement of the country immediately created a demand for lumber and other forest products.

Development of the Area

When the main line of the Canadian Pacific Railway was extended across the province, sawmills were built on the Assiniboine and its tributaries, at points suitable for receiving logs driven down the rivers from the Riding Mountain and from the western edge of the Duck Mountain. The railway reached Brandon in 1881, but records show that in the previous year, 1880, sawmills were being operated on the Minnedosa River at Minnedosa and Rapid City, and on its tributary, the Rolling River; also, on the Shell River and the Birdtail; and on the Assiniboine River itself at Millwood and Brandon. Some of the early mills were operated by water power but this was soon replaced by steam power developed from sawdust, slabs, and edgings. The Manitoba and Northwestern Railway reached Minnedosa in 1883 and was extended to Millwood and beyond in 1886. A Canadian Northern Branch line from Neepawa, reached Russell in 1908 and this completed railway development along the south side of the Riding Mountain.

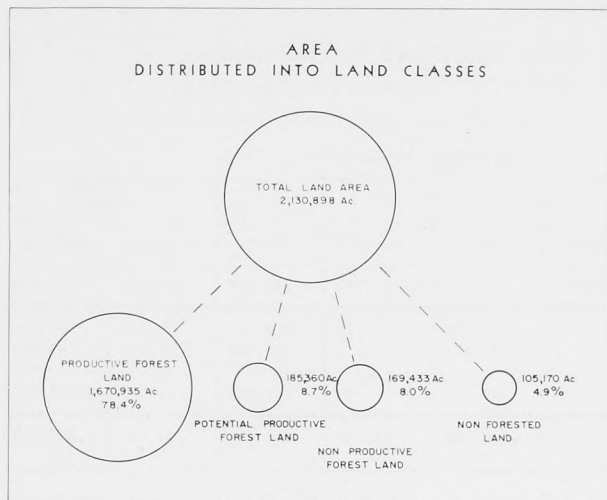


Figure 3.

The original Canadian Northern Railway was built from Gladstone to Dauphin in 1896; the line was extended northward to Cowan in 1898 and to Erwood in 1899; the lines were built westward from Dauphin to Grandview in 1900, and from Swan River to Benito in 1905. These lines opened up for agricultural development much of the country east of the escarpment, and more particularly the fertile plains of the Dauphin-Grandview region, north of the Riding Mountain, and the Swan River valley to the north of the Duck Mountain. The settlement of the lowlands stimulated lumber production and many sawmills were required to supply the demand. Most of the mills were portable, or semi-portable, many of them being part time operations, where the operators worked on farms in the summer and spent the winter in the woods. There were, however, a number of large mills of the stationary type and these mills shipped a considerable portion of their output of spruce lumber to the older settled parts of the province, to other provinces, and to the United States. Some of the larger operators are mentioned in the following paragraphs.

Shaw Bros. of Dauphin logged from licensed berths on the north slopes of the Riding Mountain from 1893 to 1906, producing about 2,000,000 ft. b.m. per year.

Theo. A. Burrows had portable mills at Garland at the foot of the Duck Mountain, at Birch River at the foot of the Porcupine, and on the Vermilion River on the north slope of the Riding Mountain, and later developed a large sawmill on the Valley River at Grandview equipped with two band head-

Table 4
Softwood and Hardwood Volume by Cover Types—Mountain Forest Section

Subsections	*VOLUME IN CUNITS BY COVER TYPES (1 cunit equals 100 cu. ft. of wood)									
	S			M and N			H			Total
	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Total
Riding Mountain National Park.....	294,026	40,666	334,692	501,360	531,215	1,032,575	93,554	4,128,599	4,222,153	5,589,420
Duck Mountain Forest Reserve.....	1,684,489	169,573	1,854,062	1,864,003	1,564,890	3,428,893	352,946	2,985,402	3,338,348	4,719,865
Porcupine Forest Reserve.....	2,063,639	186,400	2,250,039	764,001	575,876	1,339,877	51,488	432,120	483,608	1,194,456
Total Provincial Forest Reserves.....	3,748,128	356,033	4,104,161	2,628,004	2,140,766	4,768,770	404,434	3,417,522	3,821,956	5,914,321
TOTAL.....	4,042,154	396,699	4,438,853	3,129,364	2,671,981	5,801,345	497,988	7,546,121	8,044,109	18,284,307

*Net roundwood volume: stump height 1'; top diameter 3"; one stacked cord equals approximately 85 cu. ft. of wood.



Erosion in ditch at foot of Porcupine due to sudden run-off from the Upland.

PRODUCTIVE FOREST LAND BY COVER TYPE AND MERCHANTABILITY

TOTAL AREA 1,670,935 ACRES

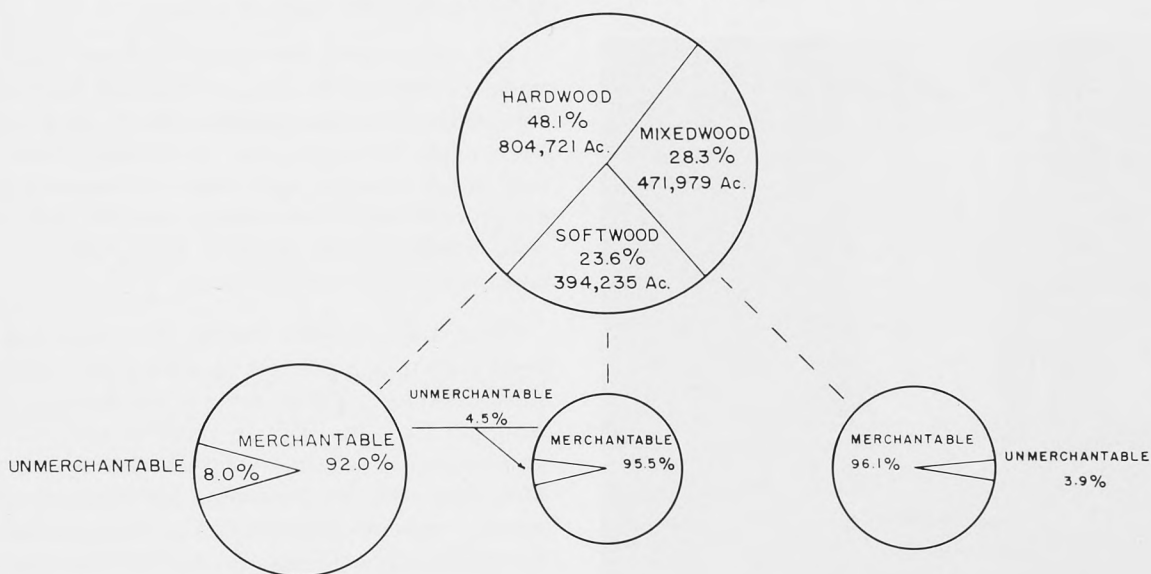


Figure 4.

saws, planing mill, etc. Logs were driven down the Valley River from the Duck Mountain, or hauled over iced roads by "steam-haulers" pulling a train of 16-foot bunk log-sleighs. This mill closed down in 1920, but in the meantime a mill of the same type was built at Bowsman on the Woody River, the logs for which were driven down that river or hauled directly from the Porcupine. The Bowsman mill produced up to 16,000,000 ft. b.m. per year and operated from 1921 to 1933.

The firm of Caverly & Sons, later Caverly Bros., operated on the south slopes of the Porcupine from 1899 to 1943, with a mill at Bowsman River, producing two or three million feet of finished lumber per year.

Mutchenbacker Bros. operated at Mafeking from 1903 to 1913, producing up to six or seven million feet per year.

The Red Deer Lumber Co. had a large fully equipped mill with band head-saws at Barrows which operated until 1924. Their production came from the slopes of the Porcupine where they had licensed berths and reached a production of up to 20,000,000 ft. b.m. per year.

These larger mills usually operated on licensed timber berths where there were concentrations of white spruce timber of large size, much of which was mature or overmature. In more recent years,

the trend has been towards portable or semi-portable sawmills operating under authority of timber sale or settler's permit. The development of mechanical equipment for road building, snow clearing, and timber hauling now enables the Forest Service to dispose of small stands of timber as they become mature, even in areas which were formerly considered inaccessible.

About 1925, a market opened up for pulpwood which had the effect of stimulating better utilization of the forest, allowing the sale of mature, but small sized, black spruce, and other species, as pulpwood, where formerly only the larger trees could be used as saw-timber. In recent years, due to the establishment of a number of small plywood mills, a new market has been found for poplar.

The Duck and Porcupine mountains are set up as registered trapline areas and produce a sizeable quantity of fur. The main species are muskrat, mink, beaver, weasel, squirrel, wolf, fox, and lynx. The Riding Mountain National Park contains one of the largest herds of elk in Canada, and elk are also found in the Duck and Porcupine forest reserves. Moose, mule deer, and white-tailed deer are found throughout the area. Numerous lakes are the summer home of ducks and geese, or serve as feeding grounds in the spring and fall migration. The pinnated grouse inhabits the more open areas; the ruffed grouse is found in parkland; while the spruce grouse prefers the heavier woods.

The native sports fish include pickerel, perch, and northern pike, while some of the lakes have the net fish, whitefish, and tullibee. Much progress has been made in recent years in stocking lakes with lake trout. Streams with their headwaters in the escarpment area have been successfully stocked with speckled and rainbow trout, and, in some cases, with small-mouthed bass.

Clear Lake on the Riding Mountain has long been known as a popular summer resort, especially since the former Forest Reserve was taken over as a National Park in 1930. In more recent times, the recreational possibilities of the lakes in the Duck Mountain and the Porcupine forest reserves have aroused increasing interest. All weather roads now link Childs, Blue, Singoosh, and Wellman lakes on the Duck Mountain with the provincial highway system, while Bell and Steeprock lakes on the Porcupine have also become accessible. Summer



Cruising a white spruce saw-timber stand in Duck Mountain.

Table 5

*Softwood and Hardwood Volume by Cover Types and Size Classes—
Mountain Forest Section*

Cover type	VOLUME IN CUNITS (100 cu. ft. units)								
	Softwood			Hardwood			Total		
	4" - 9"	10" +	Total	4" - 9"	10" +	Total	4" - 9"	10" +	Total
RIDING MOUNTAIN NATIONAL PARK									
S.....	63,392	230,634	294,026	8,768	31,898	40,666	72,160	262,532	334,692
M and N.....	105,677	395,683	501,360	129,426	401,789	531,215	235,103	797,472	1,032,575
H.....	22,621	70,933	93,554	998,296	3,130,303	4,128,599	1,020,917	3,201,236	4,222,153
TOTAL.....	191,690	697,250	888,940	1,136,490	3,563,990	4,700,480	1,328,180	4,261,240	5,589,420
DUCK MOUNTAIN FOREST RESERVE									
S.....	1,280,763	403,726	1,684,489	125,727	43,846	169,573	1,406,490	447,572	1,854,062
M and N.....	1,117,229	746,774	1,864,003	1,150,270	414,620	1,564,890	2,267,499	1,161,394	3,428,893
H.....	192,200	160,746	352,946	2,102,218	883,184	2,985,402	2,294,418	1,043,930	3,338,348
TOTAL.....	2,590,192	1,311,246	3,901,438	3,378,215	1,341,650	4,719,865	5,968,407	2,652,896	8,621,303
PORCUPINE FOREST RESERVE									
S.....	1,818,542	245,097	2,063,639	122,125	64,335	186,460	1,940,667	309,432	2,250,099
M and N.....	391,466	372,535	764,001	312,481	263,395	575,876	703,947	635,930	1,339,877
H.....	16,870	34,618	51,488	254,901	177,219	432,120	271,771	211,837	483,608
TOTAL.....	2,226,878	652,250	2,879,128	689,507	504,949	1,194,456	2,916,385	1,157,199	4,073,584
TOTAL PROVINCIAL FOREST RESERVES									
S.....	3,099,305	648,823	3,748,128	247,852	108,181	356,033	3,347,157	757,004	4,104,161
M and N.....	1,508,695	1,119,309	2,628,004	1,462,751	678,015	2,140,766	2,971,446	1,797,324	4,768,770
H.....	209,070	195,364	404,434	2,357,119	1,060,403	3,417,522	2,566,189	1,255,767	3,821,956
TOTAL.....	4,817,070	1,963,496	6,780,566	4,067,722	1,846,599	5,914,321	8,884,792	3,810,095	12,694,887
ALL LANDS									
S.....	3,162,697	879,457	4,042,154	256,620	140,079	396,699	3,419,317	1,019,536	4,438,853
M and N.....	1,614,372	1,514,992	3,129,364	1,592,177	1,079,804	2,671,981	3,206,549	2,594,796	5,801,345
H.....	231,691	266,297	497,988	3,355,415	4,190,706	7,546,121	3,587,106	4,457,003	8,044,109
TOTAL.....	5,008,760	2,660,746	7,669,506	5,204,212	5,410,589	10,614,801	10,212,972	8,071,335	18,284,307

resorts have been established, or are in process of being established, at all these lakes.

Forest Administration

The Riding Mountain area was withdrawn from settlement entry in 1895 under the title "Timber Reserve." In 1906 the Dominion Forest Reserves Act was passed and the three forest reserves, Riding Mountain, Duck Mountain, and Porcupine were established under this Act. The original Forest Act

stated that the forest reserves were to be set apart,—

"for the maintenance, protection, and reproduction of the timber growing or which may grow thereon, for the conservation of the minerals, and the protection of the animals and birds therein, and for the maintenance of conditions favourable to a continuous water supply."

No soil surveys were carried out at the time of the original reservation, but it seems to have been

MERCHANTABLE AREA AND MERCHANTABLE VOLUME BY SUBSECTIONS

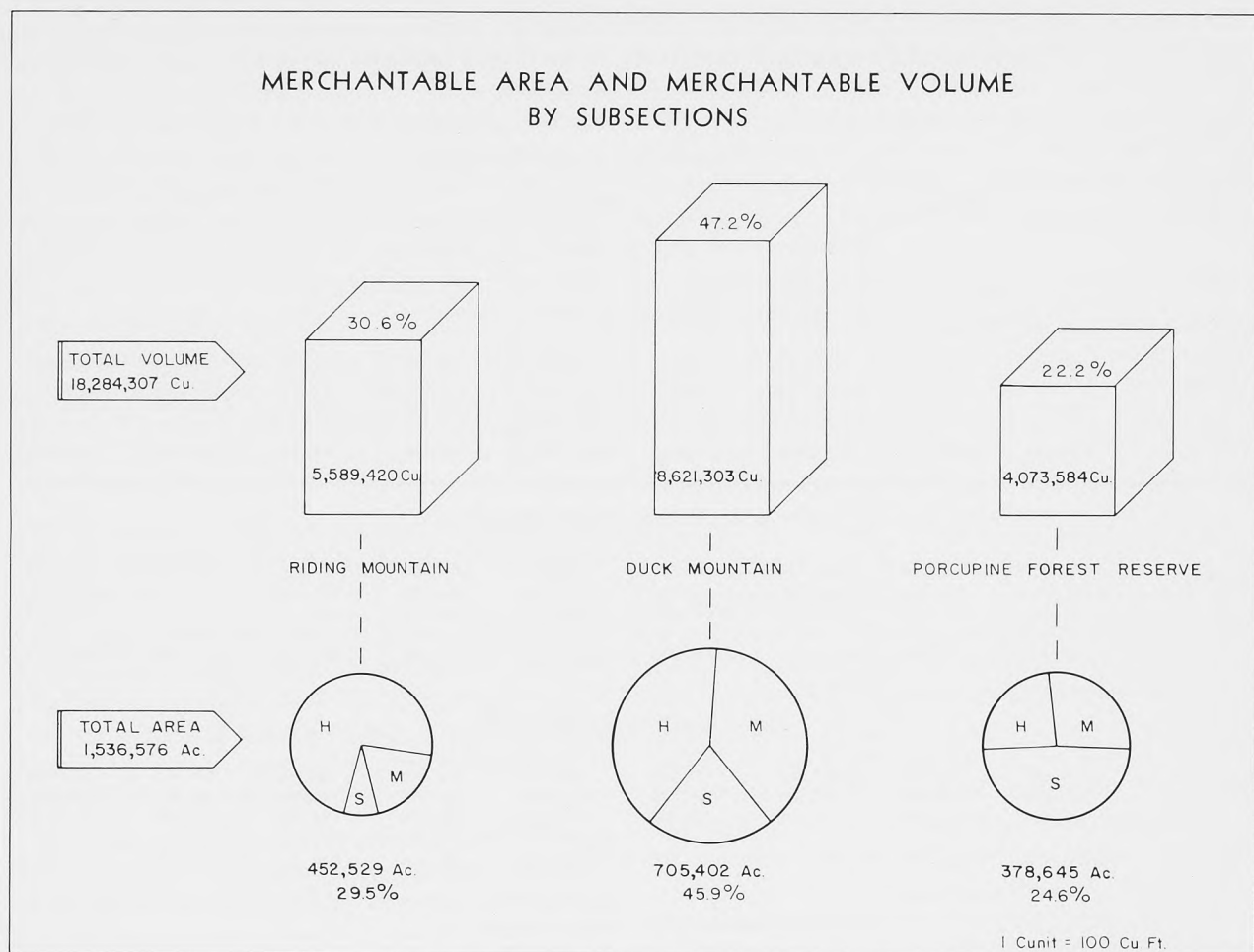


Figure 5.

recognized that these heavily wooded upland areas should remain as permanent forest areas. Soil surveys in recent years along the margins of these areas and along a few of the main roads have, in general, vindicated this decision.

Following the establishment of the forest reserves, a program of "improvements" was undertaken, consisting of boundary delineation, and the construction of ranger stations, lookout towers, roads, and telephone lines. By 1918, the Riding Mountain and the Duck Mountain had a very fair system of wagon roads, consisting of a central road and a number of branches, connecting with ranger stations located along the boundary. Ranger stations were connected by telephone line which stretched along the central roads, or, in some cases, were connected to the provincial telephone system which ran through the settlement. A number of wooden lookout towers and a few steel towers had been constructed on high



Stand of black spruce at Bell Lake, Porcupine Forest Reserve.

COMPARISON OF SOFTWOOD TO HARDWOOD VOLUME BY SUBSECTIONS

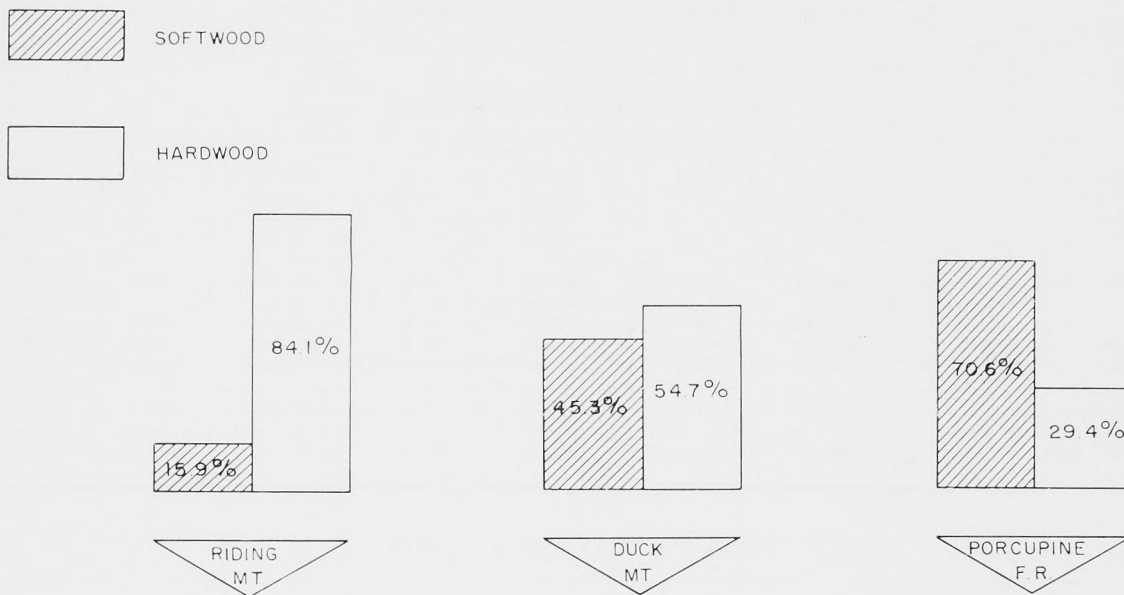


Figure 6.

points but coverage in this respect was less than adequate. Boundaries had been cut out and marked so that there was little excuse for trespass cutting.

On the Porcupine Forest Reserve little construction work was done under the Dominion regime, beyond the building of a ranger station at Birch River, a cabin at Powell, and three wooden towers without telephone connection. This area was further from the main settlement areas than the other two reserves and, for this reason, development was delayed.

A fairly intensive forest inventory survey of Riding Mountain was completed in 1911, and a reconnaissance survey of the Duck Mountain was conducted in 1913 and 1914. The first forest survey work on the Porcupine was done in 1930 and, on this survey, aerial photography was used, vertical photographs having been taken during the previous winter.

In 1930, the natural resources of Manitoba were transferred to the province, with the exception of the Riding Mountain Forest Reserve which became a National Park. Extensive development work along

the line of improvements of recreational facilities was carried on in the Park for a number of years and the Riding Mountain has become one of the most popular National Parks in Canada. The National Park is divided into 15 Warden Districts, each Park Warden being responsible to the Park Superintendent at Wasagaming on Clear Lake.

The provincial headquarters for the Western Forest District was located at Dauphin; the district including the Duck Mountain and Porcupine forest reserves and an extensive area of Crown land to the north and east in the vicinity of Lake Winnipegosis (see Forest Inventory Report No. 3).

One of the main changes in the administration after the transfer of the resources was the consolidation of control of all lands within the forest reserves under the Forest Service. Formerly, large areas of licensed timber berths in the Duck Mountain and Porcupine had been handled by the Timber and Grazing Branch of the Department of the Interior, while timber disposal on other Crown lands within forest reserves had been controlled by the Forestry Branch of the same Department.

Table No. 6—Softwood and Hardwood Volume by Species and Size Classes—Mountain Forest Section

Species	*CUNITS BY DIAMETER CLASSES						SAW TIMBER
	Total		4" - 9" D.B.H.		10" + D.B.H.		10" and over
	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>M ft. b.m.</i>
RIDING MOUNTAIN NATIONAL PARK							
White spruce.....	618,704	11.1	32,202	2.4	586,502	13.8	263,926
Black spruce.....	154,676	2.8	134,568	10.1	20,108	.5	7,886
Balsam fir.....	53,330	.9	11,500	.9	41,830	1.0	16,404
Jack pine.....	62,230	1.1	13,420	1.0	48,810	1.1	21,965
TOTAL SOFTWOOD.....	888,940	15.9	191,690	14.4	697,250	16.4	310,181
Aspen.....	3,948,402	70.6	954,651	71.9	2,993,751	70.3	1,173,999
Balsam poplar.....	564,058	10.1	136,379	10.3	427,679	10.0	167,714
White birch.....	188,020	3.4	45,460	3.4	142,560	3.3	55,905
TOTAL HARDWOOD.....	4,700,480	84.1	1,136,490	85.6	3,563,990	83.6	1,397,618
TOTAL ALL SPECIES.....	5,589,420	100.0	1,328,180	100.0	4,261,240	100.0	1,707,799
DUCK MOUNTAIN FOREST RESERVE							
White spruce.....	1,376,837	16.0	529,235	8.9	847,602	32.0	526,282
Black spruce.....	1,299,468	15.1	1,123,233	18.8	176,235	6.6	90,473
Balsam fir.....	76,636	.9	41,054	.7	35,582	1.3	18,547
Jack pine.....	1,100,133	12.8	852,855	14.3	247,278	9.3	144,809
Tamarack.....	48,364	.5	43,815	.7	4,549	.2	1,604
TOTAL SOFTWOOD.....	3,901,438	45.3	2,590,192	43.4	1,311,246	49.4	781,715
Aspen.....	3,179,032	36.9	2,370,445	39.7	808,587	30.5	389,897
Balsam poplar.....	1,049,108	12.1	624,647	10.5	424,461	16.0	194,543
White birch.....	491,725	5.7	383,123	6.4	108,602	4.1	39,756
TOTAL HARDWOOD.....	4,719,865	54.7	3,378,215	56.6	1,341,650	50.6	624,196
TOTAL ALL SPECIES.....	8,621,303	100.0	5,968,407	100.0	2,652,896	100.0	1,405,911
PORCUPINE FOREST RESERVE							
White spruce.....	588,614	14.5	176,405	6.0	412,209	35.6	252,266
Black spruce.....	1,272,808	31.2	1,183,138	40.6	89,670	7.8	44,961
Balsam fir.....	137,107	3.4	58,164	2.0	78,943	6.8	39,687
Jack pine.....	872,860	21.4	801,872	27.5	70,988	6.1	40,708
Tamarack.....	7,739	.2	7,299	.3	440	.1	152
TOTAL SOFTWOOD.....	2,879,128	70.6	2,226,878	76.4	652,250	56.4	377,774
Aspen.....	655,576	16.1	400,973	13.7	254,603	22.0	126,845
Balsam poplar.....	381,552	9.4	203,524	7.0	178,028	15.4	82,851
White birch.....	157,328	3.9	85,010	2.9	72,318	6.2	27,516
TOTAL HARDWOOD.....	1,194,456	29.4	689,507	23.6	504,949	43.6	237,212
TOTAL ALL SPECIES.....	4,073,584	100.0	2,916,385	100.0	1,157,199	100.0	614,986

Species	*CUNITS BY DIAMETER CLASSES						SAW TIMBER
	Total		4" - 9" D.B.H.		10" + D.B.H.		10" and over
	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>M ft. b.m.</i>

TOTAL PROVINCIAL FOREST RESERVES

White spruce.....	1,965,451	15.5	705,640	7.9	1,259,811	33.1	778,548
Black spruce.....	2,572,276	20.3	2,306,371	25.9	265,905	7.0	135,434
Balsam fir.....	213,743	1.7	99,218	1.1	114,525	3.0	58,234
Jack pine.....	1,972,993	15.5	1,654,727	18.6	318,266	8.3	185,517
Tamarack.....	56,103	.4	51,114	.6	4,989	.1	1,756
TOTAL SOFTWOOD.....	6,780,566	53.4	4,817,070	54.2	1,963,496	51.5	1,159,489
Aspen.....	3,834,608	30.2	2,771,418	31.2	1,063,190	27.9	516,742
Balsam poplar.....	1,430,660	11.3	828,171	9.3	602,489	15.8	277,394
White birch.....	649,053	5.1	468,133	5.3	180,920	4.8	67,272
TOTAL HARDWOOD.....	5,914,321	46.6	4,067,722	45.8	1,846,599	48.5	861,408
TOTAL ALL SPECIES.....	12,694,887	100.0	8,884,792	100.0	3,810,095	100.0	2,020,897

ALL LANDS

White spruce.....	2,584,155	14.1	737,842	7.2	1,846,313	22.9	1,042,474
Black spruce.....	2,726,952	14.9	2,440,939	23.9	286,013	3.5	143,320
Balsam fir.....	267,073	1.5	110,718	1.1	156,355	1.9	74,638
Jack pine.....	2,035,223	11.1	1,668,147	16.3	367,076	4.6	207,482
Tamarack.....	56,103	.3	51,114	.5	4,989	.1	1,756
TOTAL SOFTWOOD.....	7,669,506	41.9	5,008,760	49.0	2,660,746	33.0	1,469,670
Aspen.....	7,783,010	42.6	3,726,069	36.5	4,056,941	50.3	1,690,741
Balsam poplar.....	1,994,718	10.9	964,550	9.5	1,030,168	12.7	445,108
White birch.....	837,073	4.6	513,593	5.0	323,480	4.0	123,177
TOTAL HARDWOOD.....	10,614,801	58.1	5,204,212	51.0	5,410,589	67.0	2,259,026
TOTAL ALL SPECIES.....	18,284,307	100.0	10,212,972	100.0	8,071,335	100.0	3,728,696

*One cunit equals 100 cubic feet of wood: one cord equals 85 cubic feet of wood.

The Duck Mountain is divided into six Forest Ranger Districts, and the Porcupine into three, the Forest Ranger in each case being responsible for certain Crown land areas outside the reserves; six of the nine administrative sites are actually located outside the forest reserves. In all but one case either new ranger stations have been built since 1930 or the old buildings have been moved to new locations convenient to school and highway. In nearly all cases the rangers' headquarters have been connected to the provincial hydro system and are equipped with modern plumbing.

In recent years the road system within the reserves and the National Park has been greatly improved. Highway No. 10 runs through the Riding Mountain and skirts the eastern edge of the Duck Mountain and Porcupine. The central road, running north and south through the Duck Mountain, is approaching completion as an all weather road, and an east and west road has been constructed. A



White spruce logs in millyard, Durban Ranger District, Duck Mountain.

COMPARISON OF SAW-TIMBER TO CORDWOOD VOLUME FOR SOFTWOOD AND HARDWOOD

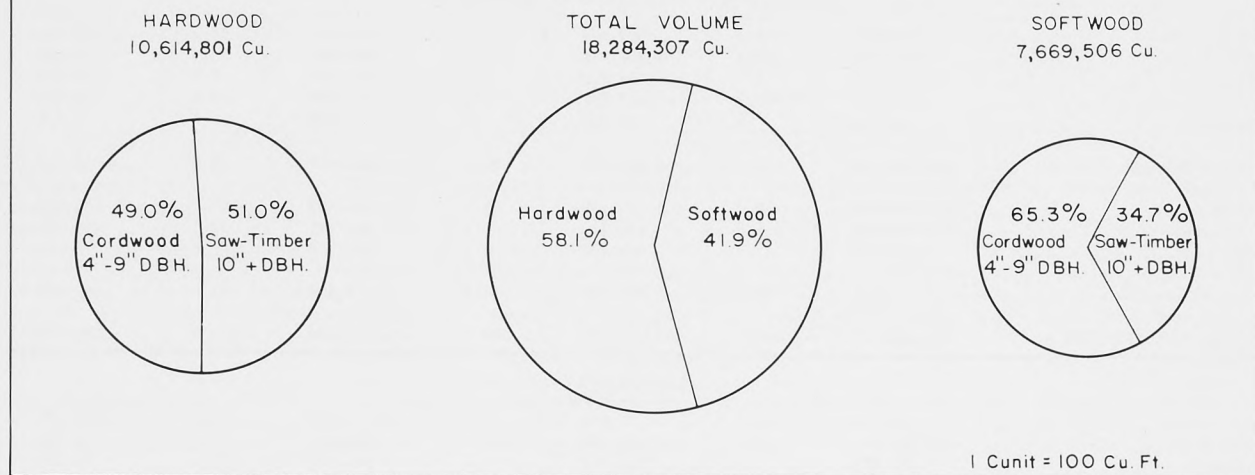


Figure 7.

start has been made on the Porcupine by the construction of a road to Bell and Steeprock lakes, with a branch to Hart Mountain.*

Protection

Like all forest areas the Mountain Forest Section is subject to damage from fire, insects, and disease. During the dry period, 1885-1895, a large proportion of the three upland areas was, more or less, completely burned over. Fortunately, most of this area is now heavily wooded as a result of natural regeneration, and much of the new growth has reached merchantable size. An epidemic of larch sawfly killed practically all tamarack in the area between 1906 and 1916, but other insect damage has been minor. The most serious tree disease is probably the false tinder fungus which affects the heartwood of aspen poplar.

Experience has shown that the southern and southwestern margins of these forests have the greatest fire hazard. With this in mind, a combination fireguard and road has been constructed along the southern boundary of the Porcupine and along the southern and western margins of the Duck Mountain. This system has been found to be of value in stopping fires, and also as a means of ingress to fires which may have crossed the guard or have started inside.

The Mountain Section has 21 lookout towers including a few towers located at the foot of the escarpment just outside the area. All towers are connected by telephone or radio, or both, and many of the tower locations have storehouses which are kept stocked with fire-fighting equipment.

Research on insects and diseases affecting the forest is being constantly carried on by the Division of Forest Biology, Federal Department of Agriculture. This includes an annual survey and the application of various preventive measures.

Area Classification and Forest Composition

Of the total land area of the Mountain Forest Section, 78.4 per cent has been classified as productive forest land and 8.7 per cent as potentially productive, or a total of 87.1 per cent capable of producing timber crops,—see Table 1. It is of interest to note the proportion of productive to total land is higher in the area than in any other Forest Section in Manitoba.

Table 6 shows the relatively high percentage of hardwood; the volume of hardwood makes up 58.1 per cent of the whole, leaving 41.9 per cent for softwood. The proportion of softwood increases from north to south, i.e. the Riding Mountain has the lowest and the Porcupine the highest proportion of softwood.

*1958.

MERCHANTABLE SOFTWOOD VOLUME BY SUBSECTIONS AND SIZE CLASSES

MERCHANTABLE VOLUME 7,669,506 CUNITS

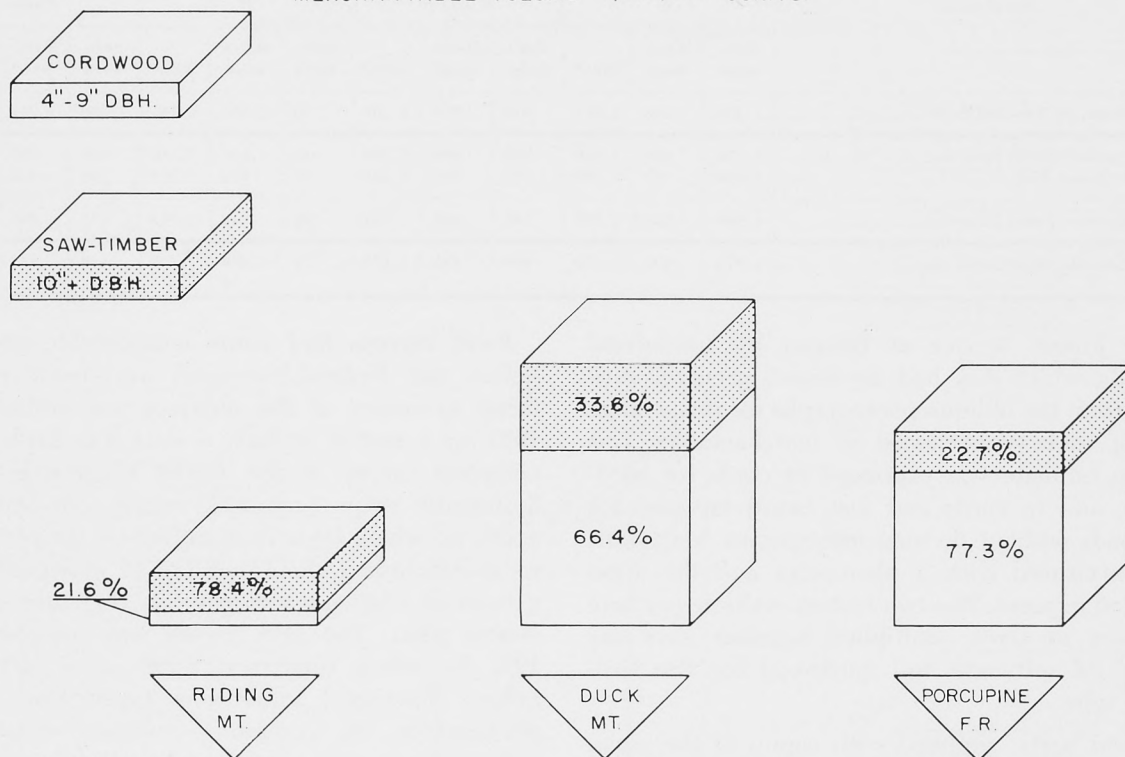


Figure 8.

Considering volume by species, aspen poplar leads, followed by black spruce, white spruce, and jack pine, in the order named. The species composition varies greatly from north to south, the Duck Mountain having the median position, the Riding Mountain running heavily to poplar, and the Porcupine to black spruce and jack pine. White spruce, from a monetary point of view, has up to date been the most important timber produced in each of the three areas, even although its total inventory volume may be exceeded by one or more other species.

Reference is made to Tables 1 to 7 which give area and volume data for each subdivision and for the whole Forest Section.

Forest Inventory

The Forest inventory of the Mountain Forest

Section was done by somewhat different methods than that used in other parts of the province, and as there was some divergence in the methods used in the three blocks, these are discussed separately.

Riding Mountain — Aerial photography by the steep oblique method was completed in March, 1937, and these photographs were used in the inventory supplemented by vertical photographs taken at an earlier date. These vertical photographs were used mainly for the mapping of topographic features and type boundaries.

The classification of the land area was made under three major divisions, viz., productive forest, nonproductive forest, and nonforested. The productive forest area was divided into three cover types, viz., softwood, mixedwood, and hardwood, each of these being again divided into merchantable and small growth.

Table 7

Cubic Foot Volume per Acre Softwood and Hardwood by Cover Types on Merchantable Area—Mountain Forest Section

Subsections	VOLUMES IN CUBIC FEET PER ACRE BY COVER TYPE											
	S			M and N			H			Total		
	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total
Riding Mountain National Park.....	906	125	1,031	578	613	1,191	28	1,239	1,267	196	1,039	1,235
Duck Mountain Forest Reserve.....	1,079	109	1,188	698	586	1,284	125	1,057	1,182	553	669	1,222
Porcupine Forest Reserve.....	1,099	99	1,198	766	578	1,344	57	474	531	760	316	1,076
Total Provincial Forest Reserves.....	1,090	103	1,193	717	584	1,301	108	915	1,023	625	546	1,171
TOTAL MERCHANTABLE AREA.....	1,074	105	1,179	690	589	1,279	70	1,068	1,138	499	691	1,190

The Forest Service at Ottawa by specialized methods, which they had developed, prepared estimates from the oblique photographs for the average acre of each type classed as merchantable. This volume estimate was expressed in cords for hardwoods, and in cords and feet board measure for softwoods without division into species. Map units were measured with a planimeter and the areas recorded in acres. The two factors—volume per acre and area in acres, multiplied together gave the volume of softwood and hardwood for the individual type.

A field party, supplied with copies of the aerial photographs for the purpose of getting additional information not obtainable from the photographs, made detailed ground cruises of certain types as a check against the aerial estimate, and to procure information as to species composition, density class, site class, and percentage defect. Field checks were made on over 1,200 one-fifth-acre plots and several hundred miles of reconnaissance strips were run.

The final report gave volumes by species, although it was recognized that the division into species was less accurate than the division into softwood and hardwood.

Duck Mountain—The area was covered by vertical photography at a scale of 1,320 ft. to one inch during the summer of 1946. Base mapping was done in 1951, in the Dauphin office, using the slotted template method. The base map consisted simply of a large sheet of paper showing the primary and secondary control points of the photographs in relation to the township grids. Ground control lines had a maximum distance apart of 18 miles.

Field surveys had made considerable progress before the Federal-Provincial agreement re the forest inventory of the province was initiated in 1951; as a matter of fact, a start was made on a complete survey of the Forest Reserve in 1942. Systematic strips were run, usually one-half mile apart, on which trees were tallied by species down to, and including, the 4 inch D.B.H. class, either on a basis of continuous strip or on regularly spaced ¼-acre plots. The field survey was completed in 1951 by which time over 2,000 acres had been tallied. Uncruised areas were typed from aerial photographs. In compiling volumes, local tree volume tables were used, based on Dominion Form



White spruce lumber in millyard, Durban Ranger District.

MERCHANTABLE HARDWOOD VOLUME BY SUBSECTIONS AND SIZE CLASSES

MERCHANTABLE VOLUME 10,614,801 CUNITS

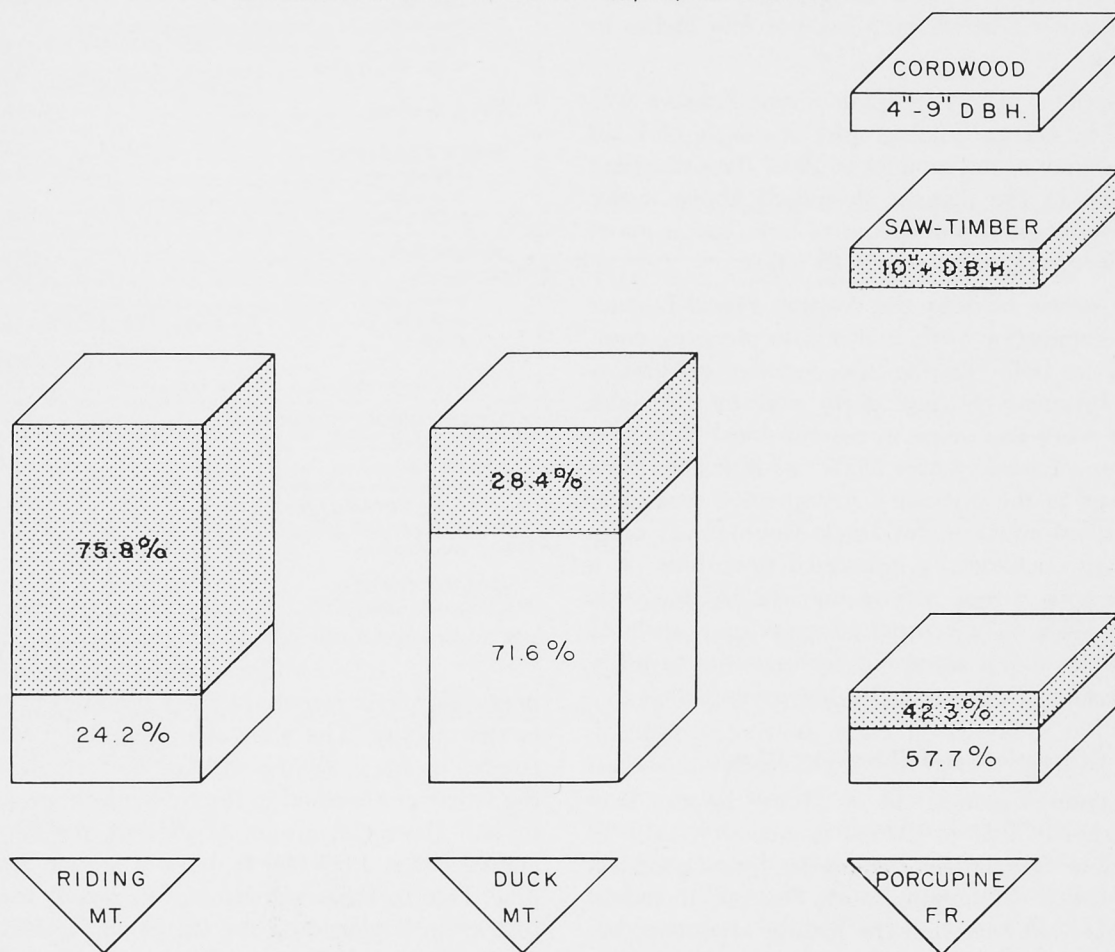


Figure 9.

Class Volume Tables. Stand volume tables showing the volume per acre for each cover type for each species were prepared based on 5,726 square plots, one-fifth acre in size, distributed throughout the Forest Reserve.

Age class stratification was based on three age classes,—Young, Intermediate, Mature and Overmature, in which stands below 4" D.B.H. were considered to be Young and without volume. A further

division, "Semi-open," was used for stands which were, more or less, all aged.

Three main cover type classes were used, viz.,
 Softwood or "S" : 75-100% conifers
 Mixedwood or "M" and "N" : 25- 75% conifers
 Hardwood or "H" : 0- 25% conifers

Separate area and volume estimates were prepared showing for each Ranger District, or minor working circle, area classification, net volume by

species, by cover type, by size class, and by broad age class. Separate cull factors by size class and species, based on local experience, were used in reducing gross volume to net volume. Converting factors for changing net merchantable volumes in cunits into board measure were also established locally. Forest type maps were prepared for each Forest Ranger District, on a scale of four inches to one mile.

Porcupine — The Porcupine Forest Reserve was covered by vertical photography at a scale of 1,320 ft. to one inch in the summer of 1949. Base mapping was done in the manner described above under Duck Mountain. Ground control lines had a maximum distance apart of about 18 miles.

Field survey work by the Western Forest District staff in connection with timber sale planning commenced in 1946. During the summer of 1952 a 7-man Inventory Survey party was in the field. Further work was done under the local staff at a later date. A total of over 3,500 one-fifth acre plots were used in the inventory. Compilation was done as described above under Duck Mountain. A complete map coverage by individual townships on a scale of four inches to one mile (1:15,840), was done in 1953. A new series of maps on a scale of 1:25,000 involving extensive changes due to additional field work has recently been completed.

Forest Utilization and Working Plans

The average annual cut of timber for the five-year period 1952-53 to 1956-57 is shown on Table 8. This Table summarizes the cut by forest products for the whole Mountain Forest Section. It should be pointed out here that the Riding Mountain, being a National Park, has different cutting regulations than the provincial forest reserves. Policy for the Riding Mountain limits the cut to timber products for the use of settlers in the vicinity, and no commercial operations are permitted except that fuelwood may be sold. For this reason, the figures in Table 8 in so far as pulpwood, railway ties, line poles, boxwood, and plywood are concerned, pertain only to the Duck Mountain and Porcupine.

A forest management plan for the Riding Mountain was put into effect in 1937-38 and this plan was revised in 1947. The management plan has the dual objective of building up and maintaining a healthy and attractive forest cover, coincident with National Park policy, and also of providing a per-

Table 8
Utilization of Forest Products Average Annual Production—Mountain Forest Section

LUMBER		<i>ft.b.m.</i>
Spruce.....	11,710,000	
Balsam fir.....	237,000	
Jack pine.....	1,069,000	
Tamarack.....	2,000	
Poplar.....	1,453,000	
Birch, etc.....	11,000	
TOTAL LUMBER.....	14,482,000	
PIECE PRODUCTS		<i>pieces</i>
Railway ties.....	36,970	
Line poles.....	882	
Fence posts.....	55,998	
PULPWOOD		<i>cords</i>
Spruce.....	22,905	
Balsam fir.....	219	
Jack pine.....	572	
Poplar.....	171	
TOTAL PULPWOOD.....	23,867	
OTHER CORD PRODUCTS		<i>cords</i>
Boxwood.....	260	
Plywood.....	226	
Green softwood fuelwood.....	150	
Green hardwood fuelwood.....	5,970	
Dry fuelwood.....	936	
Slabs and tops.....	417	
ROUND TIMBER		<i>lin. ft.</i>
Round timber.....	391,000	

petual supply of essential timber products to settlers in the vicinity. The allowable annual cut was calculated on the basis of Von Mantel's formula, where the yearly cut is equal to the timber volume divided by half the rotation age. At present, the allowable annual cut is 1,850,000 ft. b.m. of spruce and jack pine. Due to lessening demand in recent years, no restriction is placed on the cut of poplar fuelwood, fence posts, and other small material. The working plan divides the Park into nine working circles, each of which is on a sustained yield basis.

A provisional working plan for the Duck Mountain was brought into effect in 1935. The original plan was designed to control the cut of white spruce saw-timber which was in danger of being depleted. The plan was revised in 1945, and again in 1955. The last revision had the advantage of complete inventory data, and it was possible to establish the annual allowable cut for all species, including black spruce and jack pine which lend themselves to the production of pulpwood, railway ties, poles, etc., as well as lumber. The whole forest reserve is treated as one working circle but is divided into six

MERCHANTABLE VOLUME BY SPECIES

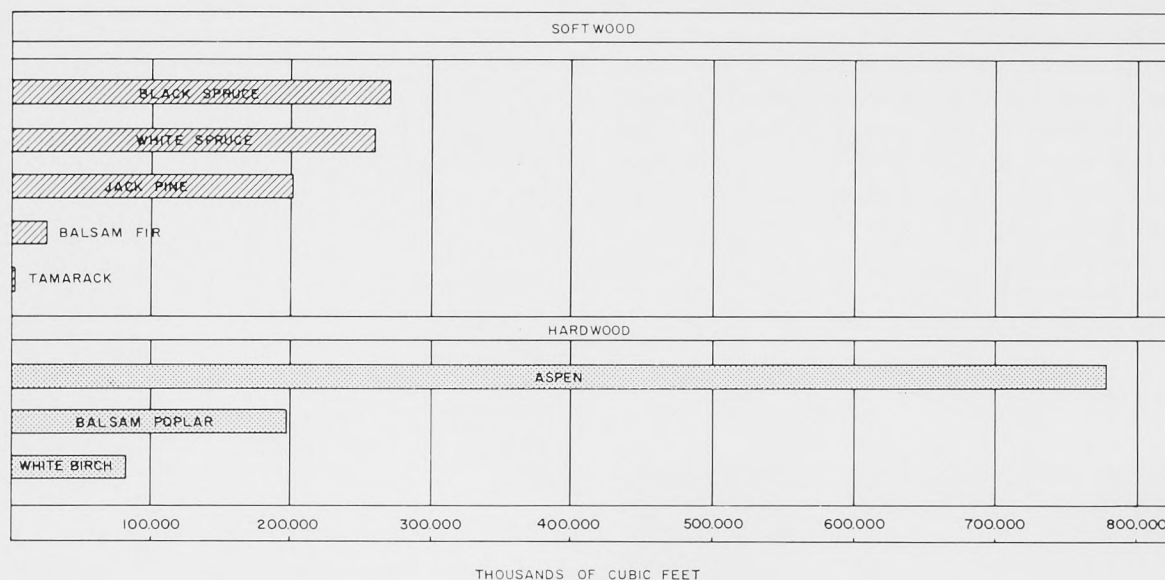


Figure 10.

minor working circles which correspond to Ranger districts. Table 9 shows the present allowable annual cut for the Duck Mountain.

The Swedish formula was used in the calculation of the allowable cut:—

$$\text{Annual Cut} = \frac{V_m + V_o + \frac{V_i}{2}}{R/3}$$

where V_m = volume of mature timber
 V_o = volume of overmature timber
 V_i = volume of immature or intermediate-aged timber
 and R = rotation age

Up to the present no formal working plan has been adopted for the Porcupine and timber has been cut on the basis of maturity, but the allowable annual cut has been calculated, using the Swedish formula, as was done on the Duck Mountain. Table 10 shows the proposed annual cut by species for the Porcupine.

Reforestation

Since the future of our forests depends on regeneration of the cut-over and burned-over areas,

the establishment of this new crop is of great concern. Contrary to a widely popular view, most of the regeneration in the forest must depend on natural seeding from the parent trees. In the Mountain Forest Section, generally speaking, nature will restock burned or cut-over areas, but not necessarily with the more desirable species. White spruce, which is considered to be the choice species for normally drained sites, and which reaches its best development when growing in stands with varying admixtures of aspen, is apt to be replaced on burned-over areas by new stands which are either pure aspen or which have an increased proportion of this species. Heavily logged spruce-aspen stands, with a small proportion of balsam fir, on the other hand, tend to be replaced by stands with a much heavier proportion of balsam fir. Research work done to date indicates that much can be done to procure an adequate proportion of white spruce, after logging, provided sufficient seed trees are left, and provided a favorable seed-bed is created by scarification of the ground so as to expose mineral soil.

A limited amount of artificial reforestation by planting and seeding has been done in this Forest Section. During the years 1920 to 1927, inclusive, a

number of experimental plots were set out at various points on the Duck Mountain. A small tree nursery was operated at Birch River Ranger Station on the Porcupine from 1925 to 1953, and the trees from this nursery were planted out in the vicinity. The total number of trees planted on the Duck Mountain and Porcupine Forest Reserves to date amounts to about 665,000, and, in addition, a small area has been seeded. The Riding Mountain National Park has operated a small nursery (first, at Lake Audy and, later, at Wasagaming) since 1925, and has planted the nursery stock in open areas of the Riding Mountain, the total planted to date amounting to 675,000 trees.



Beach at Singush Lake summer resort, Duck Mountain.

Table 9

Allowable Annual Cut—Duck Mountain Forest Reserve

Species	Expressed as volume in cunits	Converted to Products by Size Classes	
		Large timber <i>M ft. b.m.</i>	Smaller timber <i>cords</i>
White spruce.....	10,360	4,661	3,423
Black spruce.....	11,158	1,065	11,910
Balsam fir.....	1,315	379	806
Jack pine.....	11,821	1,975	10,622
Tamarack.....	543	26	622
TOTAL SOFTWOOD.....	35,197	8,106	27,383
Aspen poplar.....	67,222	9,612	63,824
Balsam poplar.....	22,824	4,718	15,045
White birch.....	7,694	749	6,035
TOTAL HARDWOOD.....	97,740	15,079	84,904
TOTAL ALL SPECIES.....	132,937	23,185	112,287

Table 10

Allowable Annual Cut—Porcupine Forest Reserve

Species	Expressed as volume in cunits	Converted to Products by Size Classes	
		Large timber <i>M ft. b.m.</i>	Smaller timber <i>cords</i>
White spruce.....	5,014	2,306	1,214
Black spruce.....	10,982	561	12,645
Balsam fir.....	2,824	921	1,167
Jack pine.....	9,113	501	10,214
Tamarack.....	87	4	98
TOTAL SOFTWOOD.....	28,020	4,293	25,338
Aspen poplar.....	13,080	3,102	8,797
Balsam poplar.....	8,288	1,982	4,509
White Birch.....	2,411	728	1,252
TOTAL HARDWOOD.....	23,779	5,812	14,558
TOTAL ALL SPECIES.....	51,799	10,105	39,896



Beach scene at Clear Lake, Riding Mountain National Park.

Appendix

ROTATION

The length of the rotation for the various species depends on the site, the product to be cut, and, to a lesser extent, the climatic region. Table 11 gives tentative figures for the productive forest area of Manitoba. A range of rotation age is given depending mainly on whether the stand is to be cut for pulpwood or saw-timber.

Table 11
Rotation by Species

<i>Species</i>	<i>years</i>
White spruce.....	80 - 120
Black spruce.....	80 - 140
Balsam fir.....	60 - 80
Jack pine.....	60 - 90
Tamarack.....	70 - 100
Cedar.....	100 - 200
Aspen poplar.....	50 - 70
Balsam poplar.....	50 - 70
White birch.....	60 - 80

ALLOWABLE CUT

A determination of the allowable annual depletion by cutting, fire, etc., is necessary in order that the forest may be kept on a sustained yield basis. The compiled inventory data presents volume by cover-type, age class, and species while area is presented by age class and cover-type only. The method of calculation most suitable to the available data is by a volumetric formula.

The simplest formula for finding the annual yield, commonly known as the Von Mantel formula, is as follows:

$$\text{Annual Yield} = \frac{\text{Growing Stock}}{\text{Half the number of years in rotation}}$$

For general inventory purposes this formula has been used as the basis for calculation of the allowable cut by Working Circles, each species being calculated separately according to its average rotation age. A deduction of 20 per cent has been made to allow for contingencies such as loss from fire, windfall, insects, and disease.

In those areas which have established Working Plans such as the Southeastern Forest Section, the Duck Mountain Forest Reserve, Pulpwood Berth No. 1, and certain other areas, various alternative methods have been used in arriving at the Allowable Cut. It is usual in these cases to secure a more accurate estimate of the Allowable Cut by methods which take into account any unevenness in age class distribution.

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Common and Botanical Names of Tree Species Included in Timber Estimates

CONIFERS

- White Spruce — *Picea glauca* (Moench) Voss
- Black Spruce — *Picea mariana* (Mill) BSP.
- Balsam fir — *Abies balsamea* (L.) Mill
- Jack pine — *Pinus banksiana* Lamb.
- Tamarack — *Larix laricina* (Du Roi) K. Koch
- Cedar — *Thuja occidentalis* L.

HARDWOODS

- Aspen poplar — *Populus tremuloides* Michx
- Balsam poplar — *Populus balsamifera* L.
- White birch — *Betula papyrifera* Marsh.

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